



NRL/MR/7440--04-8831

Moving-Map Composers System Version 3.4P Acceptance Test Procedures Developed for the Finnish Air Force Modification for FIAF MMC System Without DMUI/DMU

MICHAEL E. TRENCHARD

STEPHANIE A. MYRICK

MAURA C. LOHRENZ

MARLIN L. GENDRON

JESSICA L. WATKINS

*Mapping, Charting, and Geodesy Branch
Marine Geosciences Division*

November 29, 2004

Approved for public release; distribution is unlimited.

20050214 046

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE (DD-MM-YYYY) 29-11-2004			2. REPORT TYPE Memorandum		3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE Moving-Map Composers System Version 3.4P Acceptance Test Procedures Developed for the Finnish Air Force Modification for FIAF MMC System Without DMUI/DMU					5a. CONTRACT NUMBER	
					5b. GRANT NUMBER	
					5c. PROGRAM ELEMENT NUMBER 0603704N	
6. AUTHOR(S) Michael E. Trenchard, Stephanie A. Myrick, Maura A. Lohrenz, Marline L. Gendron, and Jessica L. Watkins					5d. PROJECT NUMBER	
					5e. TASK NUMBER	
					5f. WORK UNIT NUMBER 74-7596-04	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Research Laboratory Marine Geosciences Division Stennis Space Center, MS 39529-5004					8. PERFORMING ORGANIZATION REPORT NUMBER NRL/MR/7440--04-8831	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Naval Air Warfare Center					10. SPONSOR / MONITOR'S ACRONYM(S) NAVAIR	
					11. SPONSOR / MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.						
13. SUPPLEMENTARY NOTES						
14. ABSTRACT This document provides detailed Acceptance Test Procedures (ATP) to be followed during the final test and evaluation of the FiAF (Finnish Air Force) Moving-Map Composer (MMC) System version 3.4P, developed for the FiAF. This ATP is specifically designed to test the primary functions of the FiAF system that has been delivered and installed at FiAF Headquarters in Tikkokoski, Finland on April 24-25, 2003. Please note that the delivered MMC system does not include the Digital Memory Unit (DMU) or its interface and those functions are not included as part of this ATP.						
15. SUBJECT TERMS Acceptance Test Procedures; Finnish Air Force; Moving-Map Composer						
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UL	18. NUMBER OF PAGES 27	19a. NAME OF RESPONSIBLE PERSON Michael Trenchard	
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified			19b. TELEPHONE NUMBER (include area code) (228) 688-4633	

TABLE OF CONTENTS

TABLE OF CONTENTS.....	iii
I. INTRODUCTION	1
II. SET UP MMC SYSTEM.....	3
III. PROCESS MAP DATA	5
IV. ARCHIVE AND LOG FiAF CAC	7
V. DESIGN A MMC COMPOSITION.....	8
VI. BUILD, REVIEW AND ARCHIVE A NEW AODI AND MPS-CDI	10
VII. INSTALL A NEW COLOR PALETTE AND RE-BUILD COMPOSITION	13
VIII. BUILD AN MPS-CDI WITH FiAF DTED AND PROCESSED MAP DATA.....	18
IX. ACKNOWLEDGEMENTS.....	21
APPENDIX A: MAP DATA FORMAT INTERFACE CONTROL DOCUMENT.....	22
I. INTRODUCTION	22
II. FiAF GEOTIFF FILE FORMAT AND DIRECTORY STRUCTURE.....	22
III. FiAF COLOR PALETTE FORMAT.....	23
IV. FiAF DTED FORMAT.....	23
APPENDIX B: Acroynms	24

I. INTRODUCTION

This document provides detailed Acceptance Test Procedures (ATP) to be followed during the final test and evaluation of the FiAF (Finnish Air Force) Moving-Map Composer (MMC) System version 3.4P, developed for the FiAF. This ATP is specifically designed to test the primary functions of the FiAF system that has been delivered and installed at FiAF Headquarters in Tikkokoski, Finland on April 24-25, 2003. Please note that the delivered MMC system does not include the Digital Memory Unit (DMU) or its interface and those functions are not included as part of this ATP.

MMC 3.4P is being developed to perform the following functions for the FiAF:

- Process and archive Finnish-produced geotiff Images into Compressed Aeronautical Chart (CAC) map data, compliant to the Tessellated Spheroid (TS) Projection System.
- Allow the user to change the system color palette for a given map scale during geotiff → CAC processing.
- Design / build AOD images from user-specified CAC data;
- Write completed AOD images to militarized Write-Once Read-Many (WORM) disks (**not part of this ATP and not part of the FiAF-delivered system**);
- Design / build Mission Planning System (MPS) Compact Disk Images (CDI) from user-specified CAC data and Digital Terrain Elevation Data (DTED);
- Write MPS-CDIs to Recordable Compact Disks (CD-R) for mission planning purposes;
- Write AODs and processed CAC data to CD-Rs for archival.
- Recycle (where possible) failed AODs (**not part of this ATP and not part of the FiAF-delivered system**);
- Print final AOD and MPS image compositions, chart images, and AOD summaries (if FiAF printer is available, not part of the delivered MMC system).

Figure 1 provides an overview of the hardware platform hosting MMC 3.4P. Figure 2 provides a diagram of hardware connections from this platform to major hardware peripherals. Note that as of Design Review (DR) Meeting #1, FAF did not own all the hardware peripherals that MMC supports. Specifically, FiAF does not own a Howtek scanner or Seiko color printer, both of which are supported by MMC. In addition, FiAF does not have a GPIB board, which is required for installation of the scanner. References to all other unavailable hardware (i.e., scanner, color printer, and GPIB board) are highlighted in yellow in this document. Several sections within this ATP involve data processing. Table 1 provides a complete listing of required data sources.

Section	Source CD Label	Description
III.1 PROCESS MAP DATA	Finland 1:2M Geotiff Source #1	FiAF 1:2M scale geotiff chart data
VII.1 INSTALL A NEW COLOR PALETTE AND RE-BUILD COMPOSITION	Finland 1:2M Geotiff Source #2	FiAF 1:2M scale geotiff data including a new color palette

Table 1. Required ATP source geotiff chart data

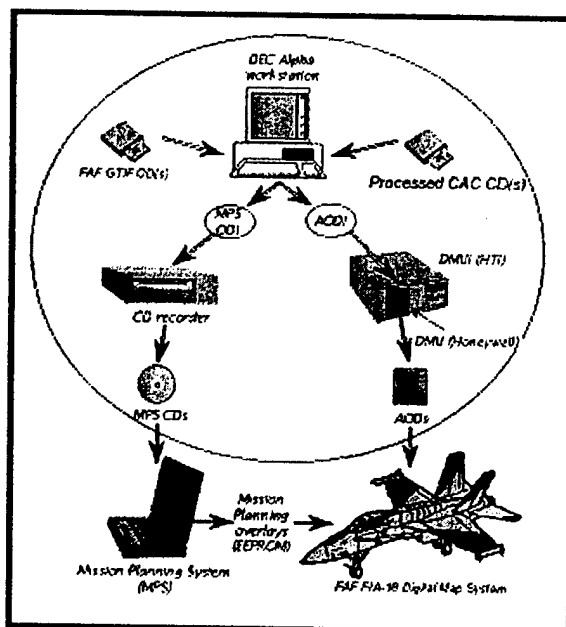


Figure 1. Overview of FiAF MMC System Hardware Platform

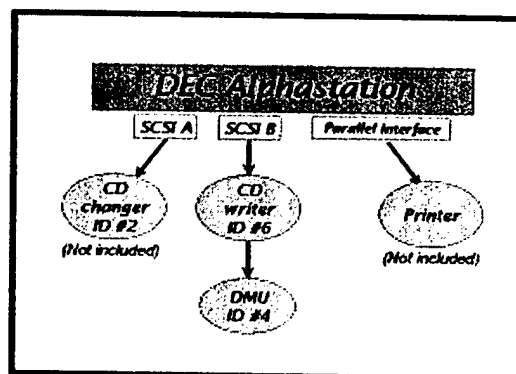


Figure 2. FiAF MMC System Hardware Connections

Note: FiAF did not procure CD changer or printer and DMU is not included in the FiAF MMC system.

II. SET UP MMC SYSTEM

This section provides all of the necessary steps for setting up the MMC System and making it available for use.

1. **Unpack all equipment** from their boxes.
2. **Parts List:** (1) DEC Alpha CPU, (1) monitor, (1) CD-writer, (1) 4mm tape drive, (1) keyboard, (1) mouse, (1) Centronix to high density SCSI-II cable, (1) Centronix to centronix SCSI-II cable, (2) SCSI-II terminators, (4) power cords, (1) box of CD-Rs.
3. **Arrange equipment in workspace:**
 - a. Place DEC Alpha CPU on table, place the CD writer on top of the CPU, and place the 4mm tape drive on top of the CD writer.
 - b. Place monitor, keyboard, and mouse next to the stack of equipment.
4. **Connect peripherals to the back of the CPU:**
 - a. Monitor: Plug the monitor's video cable into the video port on the CPU.
 - b. Keyboard / Mouse: Plug the keyboard and mouse into their respective ports on the CPU box.
 - c. CD writer: Plug the high-density SCSI-II to high-density SCSI-II cable into the external SCSI-II port on the CPU box. Plug the other end of this cable into the left-most SCSI-II port on the CD writer. Plug a SCSI-II terminator into the right-most CD writer SCSI-II port.
 - d. 4mm tape drive: Plug the Centronix - Centronix SCSI-II cable into the middle SCSI-II port on the CD writer. Plug the other end of the cable into either of the tape drive's SCSI-II ports. Plug a SCSI-II terminator into the remaining SCSI-II port on the tape drive.
5. **Power connections:**

NOTE: If the DMU and DMUI are not part of the installation, either American or European power may be used. However, all equipment must be switched to accept the power source given.

- a. Connect power cords to each peripheral (CPU, monitor, tape drive, and CD writer) and then plug to an unplugged power strip.
 - b. Verify that all equipment is turned OFF at their individual power switches BEFORE plugging in power strip.
 - c. Plug in and turn on power strip.
 - d. Turn on the peripherals:
 - i. First turn on the CD writer.
 - ii. Next turn on tape drive and monitor.
 - e. Turn on the MMC System CPU.
6. **Check device configuration and boot MMC System:**
 - a. Wait until the MMC System's ">>>>" prompt is displayed.
 - b. Check that the CD writer's red HDD light is *off*. If it is *on*, press the RESET button on the front of the CD writer (which will turn it off), then, at the ">>>>" prompt on the MMC System monitor, type **INIT**.
 - c. When the ">>>>" prompt returns on the MMC System monitor, wait 5-10 seconds, then type **SHOW DEVICE**. You should see the following listing:

DEVICE ID	Device name	Description
DKA0	RZ29B	System disk
DKA100	RZ29B	MMC disk (Disk 1 of Volume Set)
DKA200	RZ29B	MMC disk (Disk 2 of Volume Set)
DKA400	RRD45	Internal CD-ROM drive
DVA0		
MKB400	YNGMINDS TURBO STUDIO	CD Writer
EWA0		00-00-F8-00-E7-43
PKA0	SCSI Bus ID 7	Internal SCSI Bus - A
PKB0	SCSI Bus ID 7	External SCSI Bus - B

If this listing is incomplete or inaccurate: turn off the CPU, then turn off the power strip, next, turn the power strip back on, and then turn the CPU on. Repeat the steps in II.6 until the listing is complete or after two attempts, call NRL.

- d. When the device listing is correct, type **B** (for boot) at the ">>>" prompt. It will take about 3 minutes to completely boot the system.

7. Login:

Username: MMC

Password: 8675309

8. ATP Pass:

✓ System boots up correctly and user is able to log in.

Yes ☐

No

☐

9. Exceptions Noted:

III. PROCESS MAP DATA

In this section, you will create the processed map data that will be used throughout the rest of the ATP. For FiAF, the source data for MMC to process are geotiff map files. MMC reads geotiff map files from CD and can only process one scale of geotiff data on any given CD. A CD may contain (but is not required to contain) a color palette file for that scale of map data (see Appendix A). The volume label and directory structure for the geotiff map files are also defined in Appendix A. Table 2 lists the source data CDs that are required for this section. **MMC will not process FiAF map data that does not conform to the map data and directory structure formats listed in Appendix A.**

CD Label	Description
Finland 1:2M Geotiff Source #1 (no color palette)	FiAF 1:2M scale charts

Table 2. Required source data CD for this section

1. Install CD-ROM containing source Geotiff map files:

- Install CD-ROM labeled: *Finland 1:2M Geotiff Source #1*.
- From the MMC main menu, click on *Tools*, then *Data Processing*.
- Under *Process Scale*, select *JNC(1:2M)*.
- From the **CD-ROM Site Window**, select CD-ROM drive 7, click on *Scan Readers*.
- Once the Volume ID of the CD-ROM is shown (FAF_GTIF), click *Start Processing*.
- This CD-ROM contains source data that will be processed using the existing color palette (therefore, it does not contain a new color palette file). In section VIII titled "Install A New Color Palette And Re-Build Composition", data are processed using a new color palette. Click *Yes* to use the system color palette (see Appendix A for more details).

2. Process the Geotiff map files:


- The **GeoTIF Processing Window** displays information about disk usage, processing options, and advanced options.
- Select the Advanced Options menu and click on the *Optimization* option. Now, click on the *Finalize Automatically* box to insert a check status.
- Review the **GeoTIF Processing Window** information, making sure that the *Finalize Automatically* option is "checked," then click *Accept*.

NOTE: When *Finalize Automatically* is checked, MMC will not allow more data at the same map scale to be processed until this data has been archived and/or deleted from the system. If more than one CD-ROM of map data at a given scale requires processing, do not select *Finalize Automatically* until the final source CD-ROM has been processed.

- A bitmap of the map segments to be processed from this geotiff data is displayed. Verify the approximate geographic extents of the map coverage shown and if correct, click *Yes*.
- A processing meter appears near the bitmap coverage of the data to be processed. The bitmap displays map segments that have not been processed and compressed. The bitmap

becomes smaller as more map segments are processed. Once processing is complete, click *Acknowledge*, and then click *Okay*.

3. Review the Processed map data (FiAF CAC) on hard drive:

- a. From the main menu, click on *Coverages*, then *Include Processed Coverage*.
- b. Select *PROCESSED-HD-MAP5* in the dialog box, and then click *OK*.
- c. On the toolbar (located at the bottom of the MMC window), change the map projection of the display from *Mercator* to *North Polar* and use the  button to zoom into the location of the map coverage.

NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Use Virtual Colors* (see MMC main menu under *Preferences*, then *Display Options*).

- d. Move the mouse to the location of the map coverage and click the right mouse button.
- e. In the **Map Coverage** window, view and scroll the FiAF CAC and verify its geo-referenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).
- f. When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

4. ATP Pass:

- | | | |
|---|------------------------------|-----------------------------|
| ✓ Geotiff map data was processed. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| ✓ FiAF CAC is correctly geo-referenced. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| ✓ Color fidelity of the FiAF CAC is OK. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

5. Exceptions Noted:

IV. ARCHIVE AND LOG FIAF CAC

This section describes the procedures used to archive FiAF CAC files since they may be used to create new AODIs. FiAF CAC files are logged to update and maintain the MMC source database.

1. Archive the FiAF CAC:

- a. From the main menu, click on the *Tools* option, then *CDROM Options*, and then *Archive Data to CDROM*.
- b. From the **Archive to CDROM** window, click on *File*, then click *PreMaster*, and then click *Processed CAC Data*. Select the map scale *JNC(1:2M)*.
- c. If data already exists on the system, MMC will ask if you wish to delete it. Click *Yes*, then click *Yes* again to verify that you wish to proceed.
- d. Enter a descriptive title for the processed map data (e.g. First Processed 1 to 2M) using a combination of letters and numbers.
- e. When pre-mastering is complete, click *OK* and insert a blank CD-R within a CD-caddy with the label-up in the CD writer.
- f. From the **Archive to CDROM** window, click on *File*, then *Cut*.
- g. Write down the MMC-assigned name of the archived data (e.g. SC-2000-A-MAP5-X00001) and then click *Yes*;
- h. Wait until the CD writer has finished writing to the CD-R (i.e. no red or blinking green lights are on) then, remove the CD-R from the CD writer.

NOTE: Even if MMC displays a message saying the write has finished, wait until the CD writer's Read (green) and Write (red) lights stop blinking! A message advising the user to immediately log and review the archived data appears. Click on the OK button to dismiss the message.

- i. Label the CD-R with the descriptive and MMC-assigned name. Then, insert it into the CD-ROM drive.
- j. From the **Archive to CDROM** window, click on *File* then, *Close*.

2. Log the FiAF CAC:

- a. From the main menu, click on the *Tools* option, then *Media Options*, then *Log Media*.
- b. From the **CD-ROM Site Window**, select CD-ROM drive 7, click on *Scan Readers*, then *Start Processing*.
- c. When logging is complete, remove CD-R from CD-ROM drive.

3. ATP Pass:


- ✓ The processed map data has been archived and logged. Yes ☐ No ☐

4. Exceptions Noted:

V. DESIGN A MMC COMPOSITION


This section describes the procedures that are used to design a composition. A composition is a user-defined geographic coverage area (or set of areas) saved as a series of bitmaps. A composition includes a bitmap for each contiguous geographic area, within each TS zone, and at each map scale required to build the user's AOD image or MPS image.

1. Display the existing logged coverage bitmap:

- a. From the main menu, click on the *File* option, then *New*.
- b. If the Build Type Mode (either *AOD* or *MPS*, just below menu bar on far right) is not set to *AOD*, change it by clicking on *Preferences*, then *Composing MPS ON*, to *Compose AOD*, and then click *Yes*.
- c. On the toolbar, change the map scale to *JNC(1:2M)* and change the map projection of the display from *Mercator* to *North Polar*.
- d. From the main menu, click on *Overlays*, then *Available Coverage*.
- e. If needed, use the  button on the toolbar to zoom.
- f. MMC will display the coverage of the logged CD at the selected scale.

2. Design a composition:

NOTE: There are multiple ways to build a composition. Buttons in the lower left-hand corner of the screen can be used to build a composition by polygons, latitude / longitude bounds, stretch-box, and segment point and click. Also, there are similar buttons that can be used to de-select an area of coverage. Further, map coverage may be included in an image by clicking on the *Coverages* menu and then selecting one of the following options:


- a. From the lower-left corner of the toolbar, select the  button to define an area of coverage. Define a small area, less than the available coverage.
- b. MMC will display your defined areas in colored boxes (the color reflects the TS zone of the data).
- c. To check the size of the composition, from the main menu, click on *Windows*, and then the *Composition Data Size* display to see a meter showing how much disk space will be used.

3. Save your composition when you are satisfied with your defined coverage(s):

- a. From the main menu, click on the *File* option, then *SaveAs Final Composition*.
- b. When prompted for a filename, type *ATP1* and click *OK*, then enter a descriptive title and click *OK*. A confirmation window now appears with assigned numbers for the composition. Click *Yes* to confirm and close the window. This saves your composition to the hard disk.

4. Open the Final Composition:

- a. From the main menu, click on the *File* option, then *Open Final Composition* (this must be done even if the composition is still active in MMC, see note below).
- b. Scroll through the list of available compositions and select the *AOD* composition *ATP1* (not the *MPS* composition) you just created. Note that MMC has saved both an AOD and MPS version of the *ATP1* composition. All MMC compositions created in AOD mode are also valid MPS compositions, but not all compositions created in MPS mode are valid AOD compositions. In particular, an AOD composition is more restrictive than an MPS composition in maximum size limit and amount of map coverage that can be contained within a scale and

zone. MMC will display your templates on the world map. You may modify the map view on the tool bar by changing the projection or by using the  (zoom-in) button.

NOTE: An active composition that has been saved as a final composition may still be modified as long as the modifications are saved using a different composition name. Modifications made after a final composition has been saved may result in an invalid composition. Therefore, as a security measure, MMC *requires* that a final composition be opened. Once opened, the composition *cannot* be modified. All compositions are saved to the hard disk.

5. ATP Pass:

- ✓ An MMC final composition named **ATP1** containing map data at one scale has been created, saved, and opened. Yes ☐ No ☐

6. Exceptions Noted:

VI. BUILD, REVIEW AND ARCHIVE A NEW AODI AND MPS-CDI

This section describes the procedures that are used to build new AODI and MPS images. When a new image is built, the area of coverage must be defined (see section V, "Designing an MMC Composition"), and source data are identified and processed. Newly created images should be reviewed for acceptability and archived for future use. From section V, the composition **ATP1** is still open and active.

1. Build the AODI and MPS image (in AOD Mode, MMC automatically builds both):

- a. From the main menu, click on the *Tools* option, then *AOD Options*, and then *Build AOD Image*. A dialog box will appear asking you to verify that you want to build the AOD image; click *Yes*.
- b. Another dialog box appears, to confirm that it is OK to delete the previous image from the hard drive and begin a new build. Click on *Delete and Begin New Build* to continue.
- c. When the user clicks on *Delete and Begin New Build*, MMC will pop up a **Data Source** window showing which data sources (e.g., FiAF CAC CDs) are needed.
- d. MMC will also invoke the **CD-ROM Site Window**. Load and process the necessary CDs one at a time using the *Scan Readers* and *Start Processing* buttons.
- e. Once all the CDs have been read and processed, the **Data Source** window will disappear and MMC will build the MPS and AOD images.
- f. Wait until MMC states that the image build is complete before continuing with the next step. Click *Acknowledge* when the build is complete.

2. Review the AOD image and Archive to CD:

- a. From the main menu, click on the *File* option, then *Open Image*, select *AOD*, and then select *Hard Disk* and click on the newly built image name. This will open the AOD image on hard disk that you just built.
- b. View the map data in the AOD image:
 - i. Move the mouse to the location of the map coverage and click the right mouse button.
 - ii. In the **Map Coverage** window, view and scroll the FiAF CAC and verify its geo-referenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Use Virtual Colors* (see MMC main menu under *Preferences*, then *Display Options*).

- iii. When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.
- c. Archive the AOD Image to CD-R:
 - i. From the main menu, click on the *Tools* option, then *CDROM Options*, and then *Archive Data to CDROM*.
 - ii. From the **Archive to CDROM** window, click on *File*, and then click *PreMaster*. Under *PreMaster*, select *AOD*.

- iii. If data already exists on the system, MMC will ask if you wish to delete it. Click *Yes*, then click *Yes* again to verify that you wish to proceed.
- iv. Enter a descriptive title for the AOD image (e.g. First Processed AOD Image) using a combination of letter and number characters.
- v. When pre-mastering is complete, click *OK* and insert a blank CD-R with the label-up in the CD writer.
- vi. From the **Archive to CDROM** window, click on *File*, then *Cut*.
- vii. Write down the MMC-assigned name of the archived AOD image (e.g. AOD-2000-001-X000001) and then click *Yes*;
- viii. Wait until the CD writer has finished writing to the CD-R (i.e. no red or blinking green lights are on) then, remove the CD-R from the CD writer.

NOTE: Even if MMC displays a message saying the write has finished, wait until the CD writer's Read (green) and Write (red) lights stop blinking! The green Disc and 8x lights will stay on. A message advising the user to immediately log and review the archived data appears. Click on the OK button to dismiss the message.

- ix. Mark this CD-R as **AOD1**. Label the CD-R with the descriptive and MMC-assigned name, and then insert it into the CD-ROM drive.
 - x. From the **Archive to CDROM** window, click on *File* then, *Close*.
- d. Review the archived AOD image from CD (repeat steps 2a-c within this section), under *Open Image*, select *AOD*, and then select *CD-ROM*. Load the **AOD1** CD and use the **CD-ROM Site Window** to select the CD for review.

3. Review the MPS image and Archive to CD:

- a. Review the MPS image on hard disk and archive the MPS image to CD by following the steps listed above (section VI.2a-e); however, select *MPS* instead of *AOD*. Mark this CD-R as **MPS1**. Label the CD-R with the descriptive and MMC-assigned name, then insert it into the CD-ROM drive to verify on MMC.
- b. After verifying **MPS1** on MMC, install the **MPS1** CD on an MPS system and review the map data. **Verify that the correct color palettes for all map scales relevant to this map data are installed on the MPS system – VERY IMPORTANT!!**

NOTE: An AOD image *contains* internal color palettes that are copied from the MMC system palette directory during AOD build. A later change to the MMC system color palettes will *not* affect the color fidelity of a given AOD image. However, an MPS image *does not contain* internal color palettes and relies on the installed system palettes (e.g. MMC, MPS system). Therefore, a color palette change will severely degrade the color fidelity of previously built MPS images. This will become apparent in section VIII.8 where image color palettes are checked for obsolescence.

4. ATP Pass:

- ✓ The final composition **ATP1** was used to build MPS and AOD images.
- ✓ The **AOD1** and **MPS1** images were reviewed and verified on the hard disk.

Yes ☐ No ☐

Yes ☐ No ☐

✓ The **AOD1** and **MPS1** images were archived to CDs, then reviewed from the archived CDs.

Yes ☐ No ☐

✓ The MPS CD (**MPS1**) was verified on a MPS system without error.

Yes ☐ No ☐

5. **Exceptions Noted:**

VII. INSTALL A NEW COLOR PALETTE AND RE-BUILD COMPOSITION

In this section, you will install a new color palette on MMC when processing more source geotiff map data. *There is no stand-alone program on MMC to install a color palette without processing additional map data.* In other words, a new color palette can only be generated as part of processing new map data. A separate PC-based program named **MAKEPAL.EXE** that is provided by NRL must be used to convert a Finnish color palette text file into a binary color palette file (see Appendix A for Finnish color palette file format). The binary color palette file and its associated geotiff map files are then transferred to a CD-ROM. This CD-ROM is the source for MMC to begin processing. For the ATP, a CD containing Finnish 1:2M geotiff data including a new color palette has been created to demonstrate this procedure.

NOTE: Color palettes *should remain static* since changing a color palette will require re-processing of all previous map data at a given scale and render all archived AODI and MPS media obsolete. **This function should be used sparingly.**

1. Process Map Data:

- a. Install the CD-ROM labeled: *Finland 1:2M Geotiff Source #2*.
- b. From the MMC main menu, click on *Tools*, then *Data Processing*.
- c. Under *Process Scale*, select *JNC(1:2M)*.
- d. From the **CD-ROM Site Window**, select CD-ROM drive 7, click on *Scan Readers*.
- e. Once the Volume ID of the CD-ROM is shown (FAF_GTIF), click *Start Processing*.

NOTE: A dialog box will appear that states: "A SCAC (Scanned Compressed Aeronautical Chart) exists for this scale, but the processed data has NOT been deleted. The SCAC must be logged in and reviewed and the processed data must be DELETED off the hard drive for this scale before processing can continue." You may click *Delete Processed Data Now*, or delete the processed map data from the main menu under the *System* option. The term SCAC is actually a misnomer from a previous version of MMC when processed map data was derived solely from scanned paper charts.

- f. This CD-ROM contains a new color palette file, so a warning dialog box appears (figure 3) stating that the color palette installed on the CD-ROM does not match the MMC system palette. Click on *Yes Build New Palette*.

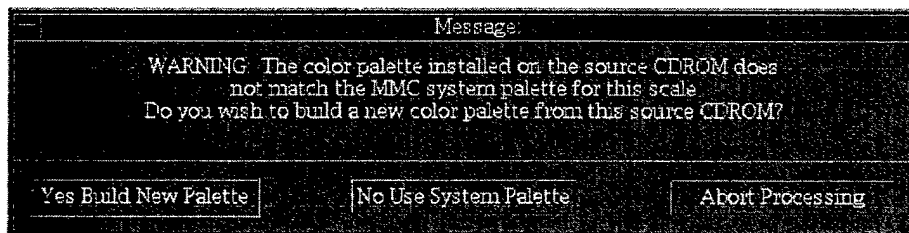


Figure 3. Color palette warning message

- g. A **Summary Information** window (figure 4) is displayed that lists cautions and recommendations to consider before creating a new color palette (use the scroll bar to read *all* recommendations). **Please read this information carefully!** Click on *I AGREE* to proceed.

Summary Information

A new color palette for this scale will be created using the color palette file on the source CDROM.

CAUTIONS:

- * All previously processed map data for this scale will be incompatible with the new color palette.
- * MPS images containing previously processed map data for this scale will be incompatible with the new color palette.
- * ACDs containing previously processed map data for this scale cannot be appended with map data processed with the new color palette.
- * An equivalent new color palette must be installed on the MPS system for compatibility with new MPS images.

RECOMMENDATIONS:

- * All previously processed map data for this scale should be re-processed with the new color palette.
- * All previously processed map data and MPS images should be destroyed or marked OBSOLETE.
- * Logged map data and map compositions from previously processed map data should be Un-logged from MMC.
 - Select MEDIA OPTIONS under the "Tools" menu.
 - Select "Unlog Media".
 - Select "Source" to remove logged source map data or "User Defined" to remove map compositions.
 - Under "Source", select "CAC", then choose "Processed CAC" and click on the selection to remove.
 - Under "Map Compositions", select "Final", then click on the selection to remove.
- * ACDs containing previously processed map data for this scale should be recycled prior to writing new map data at the same scale.
- * If more than one scale will require a color palette change, re-process all scales with the new color palettes before creating new MPS images or ACDs.

NOTE: CREATING A NEW COLOR PALETTE WILL PERMANENTLY RENDER ALL PREVIOUSLY PROCESSED MAP DATA FOR THIS SCALE OBSOLETE.

Abort

I AGREE

Figure 4. New color palette caution summary

- h. If logged map data sources exist for this map scale, a message will appear that states you must unlog these sources prior to continuing. To automatically unlog these sources, click *Yes* to the UNLOG sources message.

NOTE: Installing a new color palette renders all previously processed map data for the same scale obsolete and also renders all previous AOD Images and MPS Images obsolete. Any color palette changes made on MMC must also be made on the MPS system. A color palette with changes to only the last sixteen entries (241-256) does **NOT** require re-processing since only the first 240 color entries are used in map processing.

2. Process the Geotiff map files:


- a. The **GeoTIF Processing Window** displays information about disk usage, processing options, and advanced options.
- b. Select the *Advanced Options* button and click on the *Optimization* option, then *O.K.* Now, click on the *Finalize Automatically* box to insert a checked status.

- c. Review the **GeoTIF Processing Window** information, making sure that the *Finalize Automatically* option is "checked," then click *Accept*.

NOTE: When *Finalize Automatically* is checked, MMC will not allow more data at the same map scale to be processed until this data has been archived and/or deleted from the system. If more than one CD-ROM of map data at a given scale requires processing, do not select *Finalize Automatically* until the final source CD-ROM has been processed.

- d. A bitmap of the map segments to be processed from this geotiff data is displayed. Verify the approximate geographic extents of the map coverage shown and if correct, click *Yes*.
- e. A processing meter appears near the bitmap coverage of the data to be processed. The bitmap displays map segments that have not been processed and compressed. The bitmap becomes smaller as more map segments are processed. Once processing is complete, click *Acknowledge*, and then click *Okay*.

3. Review the Processed map data (FiAF CAC) on hard drive:

- a. From the main menu, click on *Coverages*, then *Include Processed Coverage*.
- b. Select *PROCESSED-HD-MAP5* in the dialog box, and then click *OK*.
- c. On the toolbar (located at the bottom of the MMC window), change the map projection of the display from *Mercator* to *North Polar* and use the  button to zoom into the location of the map coverage.
- d. Move the mouse to the location of the map coverage and click the right mouse button.
- e. In the **Map Coverage** window, view and scroll the FiAF CAC and verify its geo-referenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Use Virtual Colors* (see MMC main menu under *Preferences*, then *Display Options*).

- f. When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

4. Archive and Log Processed Map Data:

a. Archive the FiAF CAC:

- i. From the main menu, click on the *Tools* option, then *CDROM Options*, and then *Archive Data to CDROM*.
- ii. From the **Archive to CDROM** window, click on *File*, then click *PreMaster*, and then click *Processed CAC Data*. Select the map scale *JNC(1:2M)*.
- iii. If data already exists on the system, MMC will ask if you wish to delete it. Click *Yes*, then click *Yes* again to verify that you wish to proceed.
- iv. Enter a descriptive title for the processed map data (e.g. Second Processed 1 to 2M) using a combination of letter and number characters.
- v. When pre-mastering is complete, click *OK* and insert a blank CD-R with the label-up in the CD writer.
- vi. From the **Archive to CDROM** window, click on *File*, then *Cut*.

- vii. Write down the MMC-assigned name of the archived data (e.g. SC-2000-A-MAP5-X00002) and then click *Yes*.
- viii. Wait until the CD writer has finished writing to the CD-R (i.e. no red or blinking green lights are on) then, remove the CD-R from the CD writer.

NOTE: Even if MMC displays a message saying the write has finished, wait until the CD writer's Read (green) and Write (red) lights stop blinking! The green Disc and 8x lights will stay on. A message advising the user to immediately log and review the archived data appears. Click on the OK button to dismiss the message.

- ix. Label the CD-R with the descriptive and MMC-assigned name then, insert it into the CD-ROM drive.

- x. From the **Archive to CDRom** window, click on *File* then, *Close*.

b. Log the FiAF CAC:

- i. From the main menu, click on the *Tools* option, then *Media Options*, then *Log Media*.
- ii. From the **CD-ROM Site Window**, select CD-ROM drive 7, click on *Scan Readers*, then *Start Processing*.
- iii. When logging is complete, remove CD-R from CD-ROM drive.

- c. Mark all archived media containing the original 1:2M FiAF CAC data as obsolete (e.g. AOD1, MPS1, SC-2000-A-MAP5-X00001).

5. **Design a MMC Composition:**

- a. To demonstrate MMC error checking, from the main menu, click on the *File* option, then *Open Final Composition*, and then select the AOD composition ATP1. If the re-processed map data does not consist of at least the same map coverage as the old map data, MMC will display a warning message that not all sources for the composition are available. MMC will not allow the AOD composition ATP1 to be opened, click *Acknowledge*.
- b. However, the composition may be included as part of another composition. This will allow the user to access the composition ATP1, insert additional coverage, and then save a new final composition. From the main menu, click the *Coverages* option, then *Include Final Composition*, and then select the AOD composition ATP1. A warning message may appear that states not all of the map data exists for composition ATP1. Click *Acknowledge* to continue. The ATP1 composition should now be loaded in MMC.
- c. For the purpose of the ATP, approximately half of the coverage should be displayed at the 1:2M scale (this is the coverage of the newly processed *Finland 1:2M Geotiff Source #2* CD), since this map coverage of the *Finland 1:2M Geotiff Source #1* CD was unlogged (see section VII.1.h).
- d. Save this final composition as ATP2:
From the main menu, click on the *File* option, then *SaveAs Final Composition*. When prompted for a filename, type ATP2 and click *OK*, then enter a descriptive title and click *OK*. A confirmation window now appears with assigned numbers for the composition. Click *Yes* to confirm and close the window. This saves your composition to the hard disk.
- e. Open the final AOD composition ATP2:

- i. From the main menu, click on the *File* option, then *Open Final Composition* (this must be done even if the composition is still active in MMC, see note below).
- ii. Scroll through the list of available compositions and select the **AOD** composition **ATP2** you just created.

NOTE: An active composition that has been saved as a final composition may still be modified as long as the modifications are saved using a different composition name. Modifications made after a final composition has been saved may result in an invalid composition. Therefore, as a security measure, MMC *requires* that a final composition be opened. Once opened, the composition *cannot* be modified. All compositions are saved to the hard disk.

6. Build a new AODI and MPS-CDI:

- a. Follow the procedures listed in section VI titled Build, Review, and Archive a new AODI and MPS-CDI.
- b. Mark the respective AODI and MPS-CDI CD-ROMs as: **AOD2** and **MPS2**.

7. ATP Pass:

- ✓ A new palette for the 1:2M scale was created and installed as the new MMC system
palette for this scale. Yes ☐ No ☐
- ✓ The new geotiff map data was processed, reviewed, archived, and logged.
Yes ☐ No ☐
- ✓ A new MMC final composition named **ATP2** was constructed by including the partial
ATP1 composition. Yes ☐ No ☐
- ✓ New AODI and MPS images (**AOD2** and **MPS2**) were constructed with the
composition **ATP2**. Yes ☐ No ☐

8. Exceptions Noted:


VIII. BUILD AN MPS-CDI WITH FIAF DTED AND PROCESSED MAP DATA

This section describes the procedures that are used to build an MPS-CDI. Prior to building any MPS composition, the user must first log all the necessary NIMA data sources. As a standard practice, NRL recommends that the user log in every available data source as it is received from NIMA. In this section, we create an MPS with DTED data. Available DTED coverage is contained in a very large data set (i.e., selection of a large area of coverage could take 1-2 full days to build). The ATP demonstrates this function by defining a much smaller area of DTED coverage.

1. Log in a FiAF DTED CD:


- a. Insert the FiAF DTED CD **FAF DTED #1** in the CD-ROM drive (see Appendix A for FiAF DTED directory structure format).
- b. From the main menu, click on the *Tools* option, then *Media Options*, and then *Log Media*.
- c. MMC will display the **CD-ROM Site Window**. Select CD reader #7, click on *Scan Readers*, then *Start Processing*. MMC will prompt for a descriptive title for the CD.

2. Display the existing DTED coverage overlay:

- a. From the main menu, click on the *File* option, then *New*.
- b. Change the Build Type Mode by clicking on *Preferences* then, *Composing AOD ON* then, *Compose MPS*.
- c. On the toolbar, change the scale to *DTED_1*.
- d. From the main menu, click on *Overlays*, then *Available Coverage*.
- e. Zoom into your area of interest using the  button.
- f. MMC will display the coverage of the DTED CD you logged.

NOTE: All DTED coverage is displayed only in Mercator projection.

3. Design an MPS composition using DTED and processed map data:

- a. From the lower left-hand corner of the toolbar, select the  button to define a small area of DTED coverage.
- b. MMC displays defined DTED area(s) in colored boxes (where the color reflects the TS zone of the data). Verify the size of the MPS before proceeding (use the *Windows* menu *Composition Data Size* display). If the MPS is too large, use one of the delete data tools to remove some of the DTED from the composition.
- c. From the main menu, click on *Coverages*, then *Include Final Composition*.
- d. Select the **MPS** composition ATP2.

4. Save your work when finished. On the main menu, click on the *File* option, then *SaveAs Final Composition*. When prompted for a filename type ATP3, click *OK* then, enter a descriptive title and click *OK* again. A confirmation window now appears with assigned numbers for the composition. Click *Yes* to confirm and close the window. This saves your work to the hard disk.

5. Now reopen this composition. (As a security measure, MMC requires you to open a final composition and *not modify it* prior to building the MPS-CDI).

- a. From the main menu, click on the *File* option, then *Open Final Composition*.

- b. Scroll through the list of available compositions and select the **MPS** composition **ATP3** that you just created. MMC will display your composition on the world map.

NOTE: An **AOD** composition may also exist for **ATP3**, even though **ATP3** includes DTED data. This is the case because the CAC portion of the composition fits within the constraints of an AOD build. However, since DTED cannot reside on an AOD image, the DTED portion of the AOD composition **ATP3** would not be built. An **AOD** composition is more restrictive than a **MPS** composition in maximum size and the amount of map coverage that can be contained within a scale and zone.

6. **Build the MPS image:** From the main menu, click on the *Tools* option, then *MPS Options*, then *Build MPS Image*.

7. **Review the MPS image and Archive it to CD** (see section VI.3).

- a. Mark this CD-R as **MPS3**.
- b. After verifying **MPS3** on MMC, install the **MPS3 CD-R** on an MPS system and review the map data. **Verify that the correct color palettes for all map scales relevant to this map data are installed on a Mission Planning System.**

NOTE: MMC does not display DTED data. To ensure accuracy, MPS DTED data must be reviewed and verified on an MPS system.

8. **Re-check obsolete MPS image:**

- a. To verify that the color palette change took place in section VIII, load the **obsolete** MPS image **MPS1**. From the main menu, click on the *File* option, then *Open Image*, select *MPS*, and then select *CDROM*. Load, select, and process the **MPS1** CD.
- b. View the CAC data in the MPS image:
 - i. Move the mouse to the location of the map coverage and click the right mouse button.
 - ii. In the **Map Coverage** window, view and scroll the FiAF CAC and verify its geo-referenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode). **Since the palette for this MPS is now obsolete, the colors will be incorrect!**

NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Use Virtual Colors* (see MMC main menu under *Preferences*, then *Display Options*).

- iii. When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

NOTE: This check emphasizes the importance of either destroying or clearly marking as **OBSOLETE** any processed map data product that was created with an obsolete color palette.

9. **ATP Pass:**

- | | | |
|---|------------------------------|-----------------------------|
| ✓ A FiAF DTED CD has been logged on MMC. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| ✓ A MPS composition named ATP3 consisting of processed map data and DTED has been created. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

✓ A MPS image named **MPS3** was built, archived, and verified (on MMC and MPS).

Yes ☐

No ☐

✓ The obsolete **MPS1** image was reviewed with the new color palette to show color degradation.

Yes ☐

No ☐

10. Exceptions Noted:

IX. ACKNOWLEDGEMENTS

This work was funded by the Naval Air Systems Command (NAVAIR) F/A-18 Finland program (Airtask A4112/089-2/7257000000 and Technical Work Plan A4112-23). The authors thank Mr. Randy Powell and Mr. Andy Guy for their support of this project. We also thank Mr. Tim Woolverton (Project Manager for the Finnish Mission Data System) and Dr. Jarkko Kauppinen and Mr. Tuure Hakavouri (Finland Air Force Headquarters) for their support of this project.

APPENDIX A: MAP DATA FORMAT INTERFACE CONTROL DOCUMENT

I. INTRODUCTION

Appendix A provides detailed information on the data formats and directory structure of the Finnish source map data that may be processed by MMC version 3.4P. In addition to the Finnish-particular map data that MMC 3.4P supports (as defined below), MMC also is designed to read the following data types and associated directory structure:

- Compressed Aeronautical Chart (CAC): *The Navy Standard Compressed Aeronautical Chart Database, NOARL Report 8 (Lohrenz and Ryan), July 1990.*
- Digital Terrain Elevation Data (DTED): *Performance Specification for Digital Terrain Elevation Data, MIL-PRF-89020A, April 1996.*
- Mission Planning System (MPS) images: *Interface Control Document for Mission Planning System Optical Disk Image Version 6+C, NRL/MR/7441—97-8046 (Trenchard, et al), June 1997.*
- Aircraft Optical Disk (AOD) images: *Engineering Bulletin for Interface Control Document for the Honeywell Ground Support Station Optical Disk Subsystem, Part number 8507985-1, Used with the Honeywell Digital Video Mapping Set, Part Number 8506200-911, Engineering Bulletin EB8513923 (Ronish), April 1989.*

The following sections consist of Finnish-specific data types that are processed and supported in MMC to produce MPS and AOD images as defined in the documents listed above.

NOTE: The Finnish MMC 3.4P system is initially installed with CAC color palettes. When a color palette has been changed to support Finnish processing at a particular scale, CAC data produced by the National Imagery and Mapping Agency (NIMA) for the given scale will be incompatible with MMC.

II. FIAF GEOTIFF FILE FORMAT AND DIRECTORY STRUCTURE

1. MMC 3.4P supports geotiff files that conform to the Geotiff format specification version 1.8.1 (see <http://www.remotesensing.org/geotiff/spec/geotiffhome.html> for a full definition). MMC has tested sample Finnish geotiff map data and will support both Model Transformation Tag and Model Pixel Scale / Model Tiepoint Tag geocoding. However, due to cost constraints, MMC cannot extensively test all possible geocoding and geokey combinations, but has successfully tested Finnish implementations used to date. MMC *only* supports the *Transverse Mercator* projection when the geotiff model type is *Projected*.
2. For MMC to identify and process source media, all FiAF geotiff CD-ROMs *must* have a volume identification of **FAF_GTIF**. Otherwise, MMC will *not* process the map data. The geotiff producer is responsible for providing the CD-ROM volume identification.
3. A FiAF geotiff CD-ROM may contain any number of geotiff files for a *single* map scale and one optional *palette.bin* file. All geotiff files must contain a *TIF* suffix (e.g. *ABCDEFGH.TIF*) and all files must reside in the root directory.

III. FIAF COLOR PALETTE FORMAT

1. NRL provides the FIAF with a PC-based utility program called **MAKEPAL.EXE** (see section VIII). This utility program will convert a Finnish text color palette file into a *palette.bin* file. The *palette.bin* file may be written in addition to the source geotiff files on a **FAF_GTIF** CD-ROM. The utility program is designed to be executed on a Win NT operating system and will read a Finnish ASCII text color palette of the form:

```
#   R   G   B
---  ---  ---  ---
1 => 0   0   0
2 => 0  99  15
3 => 0 137 158
```

2. The Finnish ASCII text palette is limited to a maximum of 256 colors with valid R,G,B values ranging from 0 to 255. The program will *only* read the first 240 color palette values because the first 240 colors are reserved for map data (the remaining 16 colors are reserved for mission planning overlays). If less than 240 colors are used for the map data, the remaining map data colors must be filled with zeros (i.e. "0 0 0"). If fewer than 240 colors exist, or an R, G, or B value is out of range, the **MAKEPAL.EXE** program will not execute correctly.
3. The geotiff producer is responsible for creating the *palette.bin* file and writing this file to the **FAF_GTIF** CD-ROM. The *palette.bin* file is the color palette that will be used by MMC to process the geotiff files on the **FAF_GTIF** CD-ROM. If the *palette.bin* file is exactly the same as the MMC system palette for the *map scale selected*, MMC will use the system color palette. If *any* difference is detected between the *palette.bin* and the MMC system palette for the map scale selected, then MMC will prompt the user to either install the new palette (which will then become the new system palette for that scale) or ignore the new palette and use the MMC system palette.
4. A *palette.bin* file is optional for a **FAF_GTIF** CD-ROM. If a *palette.bin* file does not exist on a **FAF_GTIF** CD-ROM, MMC will use the system color palette for that scale by default.

IV. FIAF DTED FORMAT

1. The FIAF DTED files must conform to the structure defined in MIL-PRF-89020A, Performance Specification Digital Terrain Elevation Data (April 1996) in section 3.14.
2. MMC 3.4P will support *only* DTED level 1. DTED level 1 post (elevation) spacing is defined in section 3.9 of the DTED military specification.
3. The directory structure *and* file naming convention of FAF DTED must conform to the format defined in the DTED military specification, section 3.14.2 *with the exception* that FIAF DTED is not required to have a gazetteer, a DMED file, text files, or the GAZETTE or TEXT directories.
4. For MMC to identify and process FIAF DTED, all FIAF DTED CD-ROMs *must* have a volume identification of **FAF_DTEDxxx** (where xxx is a unique number ranging from 500-

999). Otherwise, MMC will *not* process the data. The FiAF DTED producer is responsible for providing the CD-ROM volume identification.

APPENDIX B: ACROYNMS

AOD	Aircraft Optical Disk
AODI	Aircraft Optical Disk Image
ATP	Acceptance Test Procedures
CAC	Compressed Aeronautical Chart
CD-R	Compact Disk - Recordable
DMU	Digital Memory Unit
DMUI	Digital Memory Unit Interface
DTED	Digital Terrain Elevation Data
FiAF	Finnish Air Force
MMC	Moving Map Composer
MPS	Mission Planning System
MPS-CDI	Mission Planning System – Compact Disk Image
NRL	Naval Research Laboratory
TRR	Test Readiness Review
TS	Tessellated Spheroid Projection System
WORM	Write-Once Read-Many